POSTER PRESENTATIONS BY YOUNG SCIENTISTS IN THE FIELD OF PARTICLE PHYSICS RESEARCH

1. **Nuclear modification factor of inclusive charged particles in Au+Au collisions at $\sqrt{s_{NN}} = 27\ GeV$ with the STAR experiment**

Author: **Alisher Aitbayev** (for the STAR collaboration)
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Abstract:
The Quantum ChromoDynamics (QCD) phase diagram, often represented using coordinates of temperature (T) and baryonic chemical potential (μ_B), includes a transition from a hadronic gas phase to a quark-gluon plasma (QGP) phase. The Beam Energy Scan (BES) program at Relativistic Heavy Ion Collider (RHIC) varies the gold-gold collision energy aiming to explore the phase diagram and pinpoint the critical point. BES's initial phase (2010-2014) revealed intriguing results, including the suppression of high transverse momentum particle production (p_T > 2 GeV/c) at collision energies from $\sqrt{s_{NN}}$ = 62.4 to 200 GeV that is quantified by the nuclear modification factor (R_{CP}). In 2018, STAR at RHIC collected a large-statistics dataset at $\sqrt{s_{NN}} = 27\ GeV$, ten times larger then BES-I. This poster introduces new BES-II measurements of inclusive charged particles at 27 GeV, extending BES-I findings across a wider transverse momentum range with better precision. The relevant physics implications including the potential jet quenching effects at low energy collisions will also be discussed.

2. **Analysis of Λ and K0s production in Xe+CsI collisions at the BM@N experiment**

Author: **Ramin Barak**
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Abstract:
The aim of this work is investigation of the production of strange particles during the second order phase transition from the baryonic matter to the so-called Quark-Gluon-Plasma (QGP). The following two particles were studied: lambda hyperon and neutral short-lived kaon. Algorithms were developed to enable the reconstruction of these two particles and their functionality was tested by comparing the resulting mass distributions in both cases to the expected values. Furthermore, an in-depth analysis was performed related to reconstruction efficiency of the lambda hyperon and neutral short-lived kaon when employing experimental data. Finally, some preliminary research has occurred with regards to tuning Monte Carlo generated data to the one experienced in the latest run.

3. **Status of luminosity detector for NICA MPD**

Author: **Svyatouslav Buzin**
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Abstract:
The first stage of NICA collider operation is adjusting the convergence of beams at the point of interaction of the MPD and luminosity measurement. For this purpose a simple and reliable detector based on a very common combination of scintillator and SiPM was proposed. Detector consists of two planes located symmetrically relative to the interaction point. This arrangement allows us to determine the interaction point by time of flight measurement, separation of the residual gas scattering events and event count rate. Now the luminosity detector is under production.

4. **JUNO Oscillation Analysis**
Author: **Dmitry Dolzhikov**
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Abstract:
The Jiangmen Underground Neutrino Observatory (JUNO) is a multi-purpose detector filled with 20 kton of liquid scintillator. Currently, it is under construction at 700 m under the ground in the south of China. The main goals of the experiment are to determine the neutrino mass ordering and precisely measure the related neutrino oscillation parameters. Using reactor electron antineutrino data, JUNO can determine neutrino mass ordering with significance level of 3σ and measure oscillation parameters Δm^2_{31}, Δm^2_{21}, and $\sin^2 2\theta_{12}$ with sub-percent precision after about six years of data taking. This poster includes details of the JUNO oscillation analysis.

5. **Probing lepton flavor violation with NA64 experiment**
Author: **Svetlana Gertsenberger**
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Abstract:
The search for flavor violation of leptons is one of the most interesting problems in modern physics. Neutrino oscillations are evidence of flavor violation of neutral leptons, but such a process has not yet been discovered in the sector of charged leptons. One of the experiments aimed at searching for this process, NA64, is a fixed target experiment at CERN. In the poster is discussed the possibility of searching for conversion between charged leptons. Preliminary estimates of the sensitivity of NA64 in electron and muon beams are presented. The probability of observing the process in an experiment based on current statistics is also discussed.

6. **Invariants for angular distributions in hadronic dilepton production**
Author: **N. Gramotkov**
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Abstract:
The study of the angular distribution of lepton pairs in hadronic collisions has allowed us to test the Drell- Yan mechanism [1, 2], as well as the interaction of vector W and Z bosons. However, rotationally invariant polarization expressions can provide more accurate

measurements, improving the quality of comparisons between measurements and theoretical predictions [3, 4]. In all reference frames the angular coefficients are measured in the rest frame of the lepton pair. The angular distribution of the decay is determined by the choice of the polarization axis, i.e., by the choice of the direction of the z-axis of the rest frame of the Z-boson. The reference frames di_er only in the de_nition of the direction of the z-axis. In the literature, the Collins-Soper reference frame is most often used. In this paper we analyze the dependences of the rotational invariants on the transverse momentum q_T in the Collins-Soper [5], Gottfried-Jackson [6], u channel [7] reference frames. Leptons are produced in decays of $Z \rightarrow \ell^-\ell^+$ gauge bosons born in proton- proton collisions in the Drell-Yan process. The measurement of lepton angular distributions allows us to study in detail the Drell-Yan process, in which a quark of one hadron and an antiquark of another hadron annihilate and, through the exchange of a Z-boson or virtual photon γ^*, create a pair of oppositely charged leptons $\ell^-\ell^+$. To estimate the errors of the rotational invariants it is necessary to calculate their standard deviation σ [8], for this purpose we used the characteristics of the coefficients λ, μ, ν, whose functions are the rotational invariants. The calculations were performed on the basis of data from the E615 experiment on the scattering of π^--mesons with energy 252 GeV on a fixed tungsten target. The result of checking the rotational invariants is their good agreement with the theory: the invariants are qualitatively closer than the coefficients of the angular distributions in di_erent reference frames and lie within one standard deviation. We also analyze the rotational invariants with a zero coefficient μ, the result of which is the appearance of a scatter of values of the rotational invariants, i.e., we can conclude about the non-zero value of this coefficient.

[1] S. D. Drell and T. M. Yan, Phys. Rev. Lett. 25, 316-320 (1970) doi:10.1103/PhysRevLett.25.316

[2] V. A. Matveev, R. M. Muradian and A. N. Tavkhelidze, Lett. Nuovo Cim. 7, 719-723 (1973)
doi:10.1007/BF02728133

[3] M. Gavrilova and O. Teryaev, Phys. Rev. D 99 (2019) no.7, 076013 doi:10.1103/PhysRevD.99.076013 [arXiv:1901.04018 [hep-ph]]

[4] P. Faccioli, C. Lourenco and J. Seixas, Phys. Rev. Lett. 105 (2010) 061601
doi:10.1103/PhysRevLett.105.061601 [arXiv:1005.2601 [hep-ph]].

[5] J. C. Collins and D. E. Soper, Phys. Rev. D 16 (1977), 2219 doi:10.1103/PhysRevD.16.2219

[6] K. Gottfried and J. D. Jackson, Nuovo Cim. 33 (1964), 309-330 doi:10.1007/BF02750195

[7] J. S. Conway, C. E. Adolphsen, J. P. Alexander, K. J. Anderson, J. G. Heinrich, J. E. Pilcher,
A. Possoz, E. I. Rosenberg, C. Biino and J. F. Greenhalgh, et al. // Phys. Rev. D 39 (1989), 92-122; doi:10.1103/PhysRevD.39.92

[8] Philip R. Bevington, D. Keith Robinson, Data reduction and error analysis for the physical sciences, third edition ISBN 0-07-247227-8 2003

7. **Workload Management System for SPD Online Filter**

Author: **Nikita Greben**
Meshcheryakov Laboratory of Information Technologies, JINR, Dubna, Russia

Abstract:
SPD is an experimental facility designed for studying spin physics as part of the NICA megascience project at JINR [1]. With an estimated interaction frequency of 3 MHz, the detector is expected to generate a data flux of around 20 GB/s, equivalent to 200 PB per year. There is no possibility of long-term storage and analysis of such a huge data volume, therefore, the initial data stream should be reduced to an acceptable size for particular physics research according to the physics program of the experiment. Since the experimental facility utilizes a triggerless data acquisition system, unscrambling events from the aggregated data stream before filtering them out becomes necessary due to the stream's complex nature.
SPD Online Filter will be a software and hardware complex for the high throughput processing of primary data, performing the partial reconstruction of events and selecting only those of interest in the current research. The hardware component will consist of a collection of multicore compute nodes, high-performance storage systems and a number of control servers. The software component will include not only applied software, but also a suite of middleware, SPD Online Filter – Visor, the role of which is to arrange and execute multi-stage data processing procedures.
This poster summarizes the architecture and implementation of a prototype for the Workload Management System, one of the key components of SPD Online Filter. The Workload Management System comprises a server component responsible for controlling dataset processing by executing a sufficient number of jobs and an agent application that monitors and manages job execution on the compute node.

References:

1. *V.M. Abazov et.al* [SPD Collaboration] Conceptual design of the Spin Physics Detector // arXiv:2102.00442 [hep-ex].

8. **All-loop quantum corrections to effective potentials and its applications**

Author: **R. M. Iakhibbaev**

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Abstract:
We study the construction of effective potentials for scalar theories with an arbitrary kind of interaction. We derive a generalised renormalisation-group equation for the leading logarithms in such a theory and show on some examples how all-loop corrections affect the form of the potential. We apply our formalism to the study of potentials of different kinds, which are often used in inflationary cosmology.

9. **Nuclei dynamics in the heavy ion collisions**

Author: **Viktor Kireyeu**
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Abstract:

The formation of weakly bound clusters in the hot and dense environment at midrapidity is one of the surprising phenomena observed experimentally in heavy-ion collisions from a low center of mass energy of a few GeV up to a ultra-relativistic energy of several TeV.
Three approaches have been advanced to describe the cluster formation: coalescence at kinetic freeze-out, cluster formation during the entire heavy-ion collision by potential interaction between nucleons and deuteron production by hadronic reactions. We identify experimental observables, which can discriminate these production mechanisms for deuterons.

10. **MCP-Based Detectors for Diagnostics of Circulating Beams in the NICA Accelerating Complex**

Author: **Dmitry Korovkin**
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Abstract:
When working with circulating and extracted beams in the NICA accelerator complex, non-destructive diagnostics and ion beam monitoring are of paramount importance. One effective method for such diagnostics involves registering residual gas ions using profilometers based on microchannel plates (MCP). The creation, operation, and analysis of data from MCP-based profilometers installed in the vacuum chambers of the Nuclotron-M and the NICA Booster have demonstrated their effectiveness and demand. They have proven particularly valuable for studying and implementing the electronic cooling system. This system has shown exceptional effectiveness in accelerator tuning and in measuring low-intensity ion beams. The performance of MCP-based profilometers at the NICA accelerator complex has been showcased during the last four-month session, B4, in 2022-2023. They have played a crucial role in fine-tuning the accelerators and in adjusting the electon cooling system of the booster.

11. **Studying muon pair production on open data from CMS**

Author: **I. Korsakov**
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Abstract:
This paper presents the results of a study on the production of muon pairs in the Drell-Yan process from proton collisions at the LHC with a center-of-mass energy of 7 and 13 TeV. The work is based on open data from the CMS experiment, collected during the first and second runs of the LHC in 2010 and 2015. Differential cross-sections of the investigated process are obtained as a function of the invariant mass of muon pairs, and the kinematic distributions of muons and muon pairs are studied. A comparison is made between the results of the analysis of CMS open data and the predictions of the Standard Model, as well as previously published results from the collaboration. A partial agreement between the measurement results and calculations at the leading order of the electroweak theory and the next-to-leading order of QCD is demonstrated. The results of this work will be used in further searches for physics beyond the Standard Model, particularly in the search for candidate particles for dark matter.

12. **Two-pion Femtoscopy in Au+Au collisions at $\sqrt{s_{NN}} = 3\ GeV$ in the STAR experiment**

Author: **Anna Kraeva** (for the STAR Collaboration)
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Abstract:
The correlation femtoscopy technique makes it possible to estimate the geometric dimensions and lifetime of the particle emission region after the collision of ions. Measurements of the emission region characteristics not only at midrapidity, but also at the backward (forward) rapidity can provide new information about the boost-invariant spatio-temporal structure of source and make it possible to impose constraints on heavy-ion collision models.
This study is aimed to measure the femtoscopic parameters of identical-pion emission region in Au+Au collisions at $\sqrt{s_{NN}} = 3\ GeV$ in the STAR experiment. The extracted radii (R_{out}, R_{side}, R_{long}, $R^2_{out-long}$) and correlation strength (λ) are presented as a function of collision centrality, pair rapidity and transverse momentum. Physics implications will be discussed.

13. **Identical Pion Interferometry from Au+Au Collisions at $\sqrt{s_{NN}}$ = 3.2, 3.5, and 3.9 GeV in the STAR Experiment at RHIC**

Author: **Vinh Luong** (for the STAR Collaboration)
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Abstract:
Two-pion interferometry provides access to the spatial and temporal size, shape and evolution of their sources created in heavy ion collisions and hence offers strong constraints for the models of heavy ion collisions. In this work, we will report the measurement of correlation strength (λ) and femtoscopic radii (R_{out}, R_{side}, R_{long}, $R^2_{out-long}$) extracted from the two-pion correlation function in Au+Au collisions at $\sqrt{s_{NN}}$ = 3.2, 3.5, and 3.9 GeV. The dependence of these parameters on pair transverse momentum, pair rapidity, collision centrality, and collision energy will be presented and their physics implications will be discussed.

14. **Explaining B-physics anomalies by a non-universal Z'-boson**

Author: **A.I. Mukhaeva**
Bogoliubov Laboratory of Theoretical Physics, JINR, Dubna, Russia

Abstract:
We perform a study of the new physics effects in semileptonic FCNC processes within a low-energy approximation of the anomaly-free supersymmetic extension of the SM with additional Z' vector field. The key feature of the model is the non-diagonal structure of Z' couplings to fermions, which is parameterized by few new-physics parameters in addition to

well-known mixing matrices for quarks and leptons in the SM. We not only consider CP-conserving scenarios with real parameters, but also account for possible CP violation due to new physical weak phases. We analyse the dependence of the $b \to s$ observables on the parameters together with correlations between the observables predicted in the model. Special attention is paid to possible enhancement of $B \to K^{(*)}\nu\nu$ rates and to CP-odd angular observables in $B \to K^{*}ll$ decays.

15. **BM@N Run 8 data production on a distributed infrastructure with DIRAC**

Author: **Igor Pelevanyuk**
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Abstract:
The BM@N 8th physics run using xenon ion beams was successfully completed in February 2023, resulting in approximately 600 million events. They were recorded in around 31,000 files, with a combined size exceeding 400TB. To process all this data, the JINR DIRAC platform was chosen. Data processing consists of two steps: conversion from Raw to DIGI format and conversion from DIGI to DST. All available major computing resources were used to process the data: Tier1, Tier2, NICA cluster, the “Govorun” supercomputer.
A new method was developed to perform large-scale data productions. All types of computing jobs were thoroughly reviewed to understand CPU, RAM and disk requirements. After that, the simulation of job execution was launched to find an appropriate distributed infrastructure configuration. Using this configuration, all jobs were submitted for execution. Once all jobs were completed, their CPU performance and network usage were studied. All the data was processed with this approach.
The data processing of the BM@N 8th physics run was the first time that DIRAC was used for data reconstruction at JINR. A set of approaches, systems, and methods were developed during this campaign, they will aid in reducing the efforts required for future data reconstructions at JINR.

16. **Software complex for creating digital twins of large-scale distributed computer systems for megascience projects**

Author: **Daria Priakhina**
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Abstract:
Modern scientific research and megascience experiments cannot exist without large-scale computing systems that enable to store large amounts of data and process them in a relatively short time. Such systems are distributed data acquisition, storage and processing centers. Large-scale distributed computer systems have a complex structure, include many different components and provide shared access to data storage and processing resources. A digital twin is needed for the design, support and development of distributed computer systems. It should allow one to investigate system reliability, check various scaling scenarios and find the necessary amount of resources to solve specific tasks [1].
The Meshcheryakov Laboratory of Information Technologies (MLIT) of the Joint Institute for Nuclear Research (JINR) has developed a prototype of a software complex for creating

digital twins of distributed data acquisition, storage and processing centers [2]. Development usage examples for the computing infrastructures of the BM@N and SPD experiments of the NICA project are considered [3, 4]. The examples confirm the possibility of further use of the software complex in the design and modernization of various computing infrastructures for megascience projects.

References:

1. Priakhina D., Korenkov V. The relevance of creating a digital twin for managing distributed data acquisition, storage and processing centers // Modern Information Technologies and IT-Education. 2023. V. 19, no. 3 (in Russ.) — in press.
2. Priakhina D., Korenkov V., Trofimov V. A method of constructing digital twins for solving problems of effective management and development of distributed data acquisition, storage and processing centers // Modern Information Technologies and IT-Education. 2023. V. 19, no. 3 (in Russ.) — in press.
3. Priakhina D., Korenkov V., Trofimov V., Gertsenberger K. Verification of the simulation program for creating digital twins of distributed data acquisition, storage and processing centers // International Journal of Open Information Technologies. 2024. V. 12, no. 1 (in Russ.) — accepted.
4. Priakhina D., Korenkov V., Trofimov V., Gertsenberger K. Simulation Results of BM@N Computing Infrastructure // Physics of Particles and Nuclei Letters. 2023. V. 20, no 5. P. 1272–1275.

17. **Preliminary setup of FERS in the mini-SPD System**

Author: **Sergey Romakhov**

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Abstract:

The presentation focuses on the preliminary setup and configuration of the Front-End Readout System (FERS) developed by CAEN within the framework of testing the mini-SPD system, an integral part of the future main detector for the NICA experiment.

This report encompasses the process of preliminary setup of the CAEN FERS within the mini-SPD system, including the fundamental stages of equipment preparation, configuration, and initialisation. Particular attention is devoted to aspects of adjustment, adaptation, and verification of the FERS system's functionality under the testing conditions of the mini-SPD stand.

The findings and preliminary setup outcomes of the CAEN FERS on the mini-SPD platform may significantly impact subsequent phases of development and operation of the primary SPD detector in the NICA experiment, ensuring enhanced efficiency and acquisition of high-quality data within the realm of high-energy physics research.

18. **Monte Carlo background simulation in the boron loaded scintillator of the OLVE-HERO detector**

Author: **I. Satyshev**

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Abstract:

A project of the OLVE-HERO space detector for measuring cosmic rays in the range 1012–1016 eV is proposed. It will include a large ionization-neutron 3D calorimeter with a high granularity and geometric factor of ~16 m2 sr. The OLVE-HERO main detector is expected to be an image calorimeter with a boron loaded plastic scintillator and a tungsten absorber. Such a calorimeter can measure an additional neutron signal, which should improve the detector energy resolution, as well as the rejection power between the electromagnetic and nuclear components of cosmic rays. The Monte-Carlo results of a simplified version of the detector from the cosmic proton flux are presented. The purpose of this work is to study the background level that occurs during the formation of evaporation neutrons in the detector, their slowing down to thermal energies, followed by capture by B-10 nuclei and the production of α-particles with an energy of ~2 MeV.

19. **The result of production and test Development of technology for serial production of double-sided silicon microstrip modules at LHEP JINR for the basic installations of the NICA project**

Author: **Aleksei Sheremetev**
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Abstract:
The Silicon Tracking System (STS) for the upgraded BM@N setup of NICA will be based on comprise modules of Double-Sided microstrip Silicon Detectors (DSSD) with front-end electronics connected to sensor pads via lengthy custom designed ultralight microcables. This approach makes possible building of large aperture tracking systems but results in a challenge for developing methods for high-yield assembly technology of modules of such complexity. The requested technology has been finally developed at LHEP as a multistep process with each step followed by the quality assurance test controlled and monitored by a dedicated Construction Managing Information System (CMIS) to favor maximum yield of the STS detector-graded modules. This presentation describes the developed methods in all details and reports the results gained during production of the first batch of the BM@N STS detector-graded modules finally tested with 1 GeV proton beam at PNPI, Gatchina.

20. **Search for dark matter produced in association with a leptonically decaying Z boson with the CMS Detector at the LHC**

Author: **К. Slizhevskii**
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Abstract:
A search for dark matter particles is performed using events with a Z boson candidate and large missing transverse momentum. The analysis is based on data at a center-of-mass energy of 13 TeV, collected by the CMS experiment at the LHC, corresponding to an integrated luminosity of 137 fb^{-1} (LHC RUN2). The search uses the decay channels $Z \rightarrow ee$ and $Z \rightarrow \mu\mu$. The results are interpreted in the context of simplified models with vector, axial-vector, scalar, and pseudoscalar mediators, as well as on a two-Higgs-doublet model with an additional pseudoscalar mediator (2HDM+S). The results are also presented for studies of LHC performance to observe a hypothetical particles predicted by the

2HDM+S/a models. This analysis has been performed with Monte Carlo data, produced at a center-of-mass energy of 13.6 TeV (LHC RUN3) and an integrated luminosity of up to 300 fb^{-1}.

References:
1. A. M. Sirunyan et al. (CMS Collab.), Eur. Phys. J. C 81, 13 (2021)

21. **Study of the nonleptonic decay $\Xi^0_c \to \Lambda^+_c \pi^-$ in the covariant confined quark model**

Author: **Zhomart Tyulemissov**

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Abstract:

The nonleptonic decay $\Xi^0_c \to \Lambda^+_c \pi^-$ with $\Delta C=0$ is systematically studied in the framework of the covariant confined quark model accounting for both short and long distance effects. The short distance effects are induced by four topologies of external and internal weak $W^\pm$ exchange, while long distance effects are saturated by an inclusion of the so-called pole diagrams with an intermediate $1/2^+$ and $1/2^-$ baryon resonances. The contributions from $1/2^+$ resonances are calculated straightforwardly by accounting for single charmed Ξ^0_c and Ξ'^+_c baryons whereas the contributions from $1/2^-$ resonances are calculated by using the well-known soft-pion theorem in the current-algebra approach. It allows to express the parity-violating S-wave amplitude in terms of parity-conserving matrix elements. It is found that the contribution of external and internal W-exchange diagrams is significantly suppressed by more than one order of magnitude in comparison with data. The pole diagrams play the major role to get consistency with experiment.

22. **Upgrade of the hybrid magnetic spectrometer SCAN-3 at Nuclotron**

Author: **Valentin Ustinov**

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Abstract:

The hybrid magnetic spectrometer SCAN-3 on the internal target station of the Nuclotron accelerator has been upgraded. For this task, six multilayer neutron detectors (modules) has been developed and created. The multilayer structure is necessary to achieve high accuracy of neutron spectrometry by the time-of-flight method in the energy range of 90-300 MeV. The modules were assembled into an additional arm ("P-arm") oriented at 90 degrees to the other arms of spectrometer and the reaction plane.

The upgrade is necessary to improved study of the S_{11}-resonance in the nucleus and neutrons registration from the decay of eta-nuclei at SCAN-3. In additional, the created neutron detectors can be used to study the isospin degree of freedom of the equation of state of baryonic matter.

23. **The ATLAS B-physics trigger performance in LHC Run 3**

Author: **Artem Vasyukov** for the ATLAS collaboration

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Abstract:

B-physics programme in ATLAS includes measurements of CP violating effects in B meson decays, searches for rare b decay signatures, and studies of the production cross sections.
The trigger selection of events for B-physics analyses is primarily based on the identification of B-hadrons through decays with a muon pair in the final state.
We present an overview of the trigger system and its components as well as its performance in proton–proton collisions for the beginning of the third LHC data-taking period (2022–2023).

24. **Bjorken sum rule with new analytic coupling**

Author: **D.A. Volkova**

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Abstract:
We analyze recently obtained experimental data for the polarized Bjorken sum rule in the region of small values of Q^2. Our investigation is based on a new form of coupling constant which doesn't contain the Landau pole. We found an excellent agreement between the experimental data and the predictions of analytic QCD, as well as a strong difference between these data and the results obtained in the framework of perturbative QCD.

25. **Development of hardware solutions and software to improve RF capture by Booster and Nuclotron systems**

Author: **Anton Volodin**

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Abstract:
The preparation of the injection complex for collider experiments requires an increase in the intensity at the Nuclotron output by about 2 orders of magnitude. This will require a significant change in the operating modes of the linear accelerator and Booster and optimization of the operation of all systems of the complex, including the operation of the RF Booster and Nuclotron systems.
To increase the efficiency of accelerating stations, it was decided to develop special software and a series of devices that will increase the efficiency of RF systems. The main directions in the development of hardware solutions and software are:
(1) accumulation of the beam in the longitudinal phase space during injection into the Booster;
(2) preventing the growth of the longitudinal emittance during acceleration;
(3) transfer of a bunch-to-bunch beam from a Booster to a Nuclotron without increasing the longitudinal emittance;
(4) Minimizing losses during acceleration and beam overflows. The latter requires matching the acceleration rate with the capabilities of existing RF systems.