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

1. **T-even hadronic structure functions in the Drell-Yan process with γ/Z^0 interference**
Author: Yu.A. Anikin
Bogoliubov Laboratory of Theoretical Physics, JINR, Dubna, Russia
Abstract:
We present a study of T-even hadronic structure functions in the Drell-Yan process. Our calculations are performed in perturbative QCD using collinear factorization at order α_s, incorporating γ/Z^0 interference in the dilepton decay. We analyze the dependence on the transverse momentum of the dilepton pair and perform a statistical comparison of angular coefficients with the geometric method as well as experimental data from the ATLAS and CMS Collaborations at the LHC.

2. **Development of the VMM3A Readout Solution for the SPD Stage-I Straw Tracker**
Author: Vitaly Bautin
Veksler and Baldin Laboratory of High Energy Physics, JINR, Dubna, Russia
Abstract:
A newly engineered front-end electronics solution has been developed for the initial stage of the SPD-NICA Straw Tracker. To optimize the performance of the straw tubes, a fully redesigned schematic was created, incorporating differential buffering and external ADCs. By repurposing the existing VMM3A ASIC — originally designed for the ATLAS Micromegas detector — we achieved a cost-effective solution, reducing the price to approximately 3-5 USD per channel, with a power consumption of around 20-30 mW per channel. This device serves as a comprehensive multichannel system, efficiently handling the collection, amplification, and digitization of incoming signals.

3. **Asymptotic freedom in Fermi theory**
Author: A.T. Borlakov
Bogoliubov Laboratory of Theoretical Physics, JINR, Dubna, Russia
Abstract:
We consider the V-A Fermi interaction and apply the earlier developed method for summing up the leading asymptotics for the scattering amplitudes in non-renormalizable theories. We consider the amplitude of the fermion-antifermion scattering and derive the corresponding RG equation that sums the leading logarithmic contributions just like in renormalizable models. Numerical solution of this equation in the asymptotic regime $s \sim t \sim u \sim E2 \to \infty$ leads to the amplitude logarithmically decreasing with energy thus restoring the unitarity violated at the tree level.

4. **First JUNO Results on the Solar Oscillation Parameters**

Author: Dmitrii Dolzhikov
Dzhelepov Laboratory of Nuclear Problems, JINR, Dubna, Russia

Abstract:
The Jiangmen Underground Neutrino Observatory (JUNO) is a 20 kiloton liquid scintillator detector located 650 m underground in southern China. Designed to determine the neutrino mass ordering and to deliver precise measurements of neutrino oscillation parameters Δm^2_{31}, Δm^2_{21}, and $\sin^2\theta_{12}$, JUNO observes reactor antineutrinos from two nuclear power plants at an average baseline of about 53 km using the inverse beta decay reaction.
JUNO began physics data taking on August 26, 2025, and has accumulated 59.1 days of data for its first oscillation study. From this initial exposure, the experiment already provides the world-leading constraints on the ``solar'' oscillation parameters Δm^2_{21} and $\sin^2\theta_{12}$. This poster presents the statistical framework guiding the oscillation analysis, outlining the treatment of the reactor antineutrino spectrum, parameter inference strategy, and the approach to the evaluation of the uncertainties. The first results demonstrate JUNO's emerging capability for high-precision reactor neutrino measurements and support broader tests of lepton-flavor mixing and the robustness of the three-flavor oscillation framework.

5. **Searching for new physics in ρ^0 decays in the NA64 experiment.**

Author: Svetlana Gertsenberger
Veksler and Baldin Laboratory of High Energy Physics, JINR, Dubna, Russia

Abstract:
The NA64 setup is a universal detector designed to test a wide range of models beyond the Standard Model. Some of these models predict the production of light dark matter (LDM) particles, which are undetectable by current detectors, but their presence can be inferred from indirect signatures. These signatures include the missing or lost energy effect, which means that the "lost" energy could have been transferred to LDM particles. The NA64 experiment is searching for such particles, in particular the dark photon A' (a vector mediator between ordinary and dark matter). There are models that predict the decay of neutral vector mesons ρ, ω, and φ into A' and other LTM particles. Such a process can occur in exclusive photoproduction via the Glauber mechanism, accompanied by energy loss. The NA64 setup is sensitive to any process in which beam energy is transferred to "dark" particles, resulting in the absence of an energy signal. NA64 can set bounds on the relative decay widths of all kinematically accessible mesons. To assess the feasibility of searching for the invisible ρ^0– meson decay in the NA64 experiment, a simulation of the ρ^0– meson production process in a target (the ECAL electromagnetic calorimeter) was performed using the Geant4 package. The preliminary total yield of ρ^0– mesons in the setup's target was estimated. The energy distribution of the ρ^0– meson yield in ECAL and the angular distribution of the main decay products – pions, which then decay into muons and neutrinos – were obtained.

6. **Study of the Hyperon reconstruction in the SPD/NICA**
Author: Daniil Gubachev
Veksler and Baldin Laboratory of High Energy Physics, JINR, Dubna, Russia
Abstract:
During the first stage, SPD experiment will collect and analyze data from colliding polarized and unpolarized beams of protons and deuterons up to √s_{NN} = 10 GeV. Polarization of the Λ-hyperons produced in such events is a subject of much interest, as it can provide insight into the polarization transfer in such collisions. However, some of Λ-hyperons will be produced via decays of heavier hyperons diluting the polarization effects. This poster presents estimations of such feed-down productions among the Λ yields.

7. **Hunting nuclear clusters: Cluster finding using Coalescence, MST and Simulated Annealing**
Author: Viktar Kireyeu
Veksler and Baldin Laboratory of High Energy Physics, JINR, Dubna, Russia
Abstract:
A new open-source cluster finding library "Common Clusterization Library" (CCL) is proposed to describe the clusters production when applied to the transport codes. The new library was applied to the Parton-Hadron-Quantum-Molecular Dynamics approach to be comparable with the established and well known MST and SACA implementations on the same set of the events. The presented procedures were tested with rapidity density distributions and complex observables like Mimf and Zmax vs Zbound2 at the energies of ALADiN and NA49 experiments. A modified simulated annealing chain was used to reduce the computational time. The new "stable" clusters tracking algorithm "sMST" for the "lost" QMD cluster recovering is presented. The results of the "box-like" coalescence procedure and a mixed method which incorporates the coalescence algorithm steps and the negative binding energy criteria are presented. The difference between the Helium-3 found by the MST-based cluster finding procedure and the coalescence algorithm applied on the same set of events and baryons is shown for the first time.

8. **Degradation of Thermal Conductivity in Epoxy-Resin Composites with Diamond Fillers under Irradiation**
Author: Tuyna Ligdenova
Veksler and Baldin Laboratory of High Energy Physics, JINR, Dubna, Russia
Abstract:

A method for irradiating samples of dielectric composites based on epoxy resins and diamond fillers, intended for adhesive joints in heat removal circuits of microelectronic devices operating in high-radiation fields, is described. It is based on placing the samples inside a massive lead target, which is subsequently irradiated with an intense proton beam at an energy of 660 MeV. The dose accumulated by the samples from the interaction with primary and secondary particles is evaluated using mutually complementing FLUKA and MCNPX models. The results obtained are compared with each other and with dose estimates derived from the induced activity of the Na22 isotope in monitor aluminum foils accompanying the irradiated samples. The primary parameter analyzed is the thermal conductivity of the samples, which degrades under irradiation

9. **Measuring the spatio-temporal characteristics of meduim produced in heavy-ion collisions**
Author: Egor Nedorezov
Veksler and Baldin Laboratory of High Energy Physics, JINR, Dubna, Russia
Abstract:
One of the main interests of high-energy physics is the study of the phase diagram and the localization of phase transitions from hadronic to quark–gluonic matter. There are different techniques to study the hot matter. One of them is femtoscopy, which uses two-particle correlations to extract spatiotemporal characteristics of the emission source. Another approach is based on the analysis of momentum spectra of produced particles and the extraction of thermodynamic parameters. In this work, we perform a comparative analysis of the system volume obtained using the Blast-Wave model with finite size and the cylindrical freeze-out volume calculated from femtoscopic correlation radii. We observe that the femtoscopic volume is systematically smaller than the one derived from the Blast-Wave model. In the future, these results can help to combine these two different methods and provide a more comprehensive picture of the fireball produced in heavy-ion collisions.

10. **Probing Hydrdynamics at 7.7 GeV: Model Comparisons of the Bulk Properties of Au+Au Collisions**
Author: Oris Eng
Abstract:
We study hydrodynamic effects in the measurements of bulk properties of the matter produced in Au+Au collisions at √sN N = 7.7 GeV using identified hadrons (π±, K±, p and ¯ p) with AMPT, EPOS4, SMASH and PYTHIA8 models. Midrapidity (|y| <0.1) results for invariant particle yield, average transverse momenta and particle ratios, in dependence of various collision centralities are presented and compared with the 2010 collected data from STAR experiment in the Beam Energy Scan (BES) Program at the Relativistic Heavy Ion Collider (RHIC).

11. **Remote access and synchronization subsystem of electronic cards for the TPC/ MPD detector of the NICA project**

Author: Denis Potapov
Veksler and Baldin Laboratory of High Energy Physics, JINR, Dubna, Russia

Abstract:
An important milestone in the implementation of the NICA project has been achieved with the successful injection of a heavy xenon ion beam into the collider ring. The first physics run of the Multi-Purpose Detector (MPD) is planned for mid-2026. The Time Projection Chamber (TPC), serving as the main tracking and particle identification detector of the MPD, will operate during this run.
The large volume of data produced by the TPC will be processed by its Data Acquisition System (DAQ), which includes 1,488 Front-End Cards (FECs) along with other electronic modules located both inside and outside the MPD magnet.
This report presents one of these modules, designed as a remote access and synchronization subsystem for the detector electronics. The module integrates two functional units implemented on a single printed circuit board. The first unit provides versatile remote access to the FECs, while the second unit is intended for precise synchronization of the front-end electronics.

12. **Casimir effect under fast rotation in heavy-ion collisions**

Author: D.V. Prokhorov
Bogoliubov Laboratory of Theoretical Physics, JINR, Dubna, Russia

Abstract:
As a model system for studying vacuum effects in relativistic heavy-ion collisions, the configuration of two parallel, perfectly conducting plates is considered. To this end, the Casimir effect between parallel plates uniformly moving along a circular trajectory of radius R with angular velocity Ω in the equatorial region is investigated. The renormalized vacuum energy density for a massless scalar field is calculated up to $\Omega^2 R^2$. The influence of temperature is also taken into account, and the corresponding corrections are calculated. The obtained result indicates that at low angular velocities, rotation does not affect the Casimir energy density. Low angular velocities are understood as: In natural units ($\hbar = c = 1$) $\Omega R \ll 1$, then $\Omega \ll 1$ fm^{-1} and $\Omega \ll 200$ MeV, which is qualitatively compatible with current estimates of vorticity in heavy-ion collisions.

13. **Advanced experimental setup for studies of small straw-tracker prototypes for the SPD detector**

Author: Sergey Romakhov
Veksler and Baldin Laboratory of High Energy Physics, JINR, Dubna, Russia

Abstract:
A multifunctional setup has been developed for testing first prototypes of the SPD Straw Tracker. The setup was successfully operated during test beams at CERN in 2024 and 2025, combining a wide range of detectors and front-end electronics. It includes a reference timing system formed by four trigger scintillator counters with coincidence logic. The reference tracking system consists of a set of Micromegas detectors equipped with TIGER-based readout electronics, and a silicon TimePix4 detector. The setup is dedicated for performance studies of straw prototypes. One of the prototypes is a combined construction of three double-layers of straws with diameters of 5, 10, and 20 mm. Another one is reproducing the concept of the SPD Straw Tracker geometry which uses stereo-angle layers ("U" and "V") additional to the layers "X" where the straws are aligned with the longitudinal SPD detector axis. This prototype consist of four XUVX double-layers. Several types of readout electronics are tested with those prototypes. All readout components have own independent Data Acquisition Systems. Synchronization approach developed allowing the integration of data from different DAQ systems into unified hits is presented.

14. Strange hadron production in Au+Au collisions at $\sqrt{s_{NN}}$= 3 − 27 GeV with UrQMD

Author: Artem Timofeev
Veksler and Baldin Laboratory of High Energy Physics, JINR, Dubna, Russia

Abstract:
Strange hadrons serve as critical probes for characterizing the hot and dense nuclear matter produced in heavy-ion collisions. Their utility arises from two key factors: they provide unique insights into the QCD phase transition and possible QGP formation, and they exhibit strangeness enhancement - a phenomenon where their production is significantly higher in deconfined matter than in standard hadronic interactions. This enhancement, coupled with their sensitivity to hadronization conditions, makes them ideal observational tools.
In this work, we study the model dependence of the spectra for K0s, Lambda, Xi and Omega hadrons as functions of transverse momentum, rapidity and collision centrality. The analysis covers the collision energy range $\sqrt{s_{NN}}$= 3-27 GeV, which probes the dynamics of matter at the onset of deconfinement. Precise measurements of strange particle yields and their ratios in Au+Au collisions thus have the potential to deepen our understanding of the thermodynamics of hot matter and the hadronization process near the phase boundary.

15. Weak nonleptonic decays of vector B-mesons

Author: A. Tyulemissova
Bogoliubov Laboratory of Theoretical Physics, JINR, Dubna, Russia

Abstract:
We study the radiative and weak nonleptonic decays of vector B mesons within the covariant confined quark model. First, we calculate the matrix elements and decays widths of the radiative decays $B^* \to B\gamma$. The obtained results are compared with those obtained in other approaches. Then, we consider the nonleptonic decays $B^* \to DV$ which proceed via tree-level quark diagrams. We show that the analytical expressions for the amplitudes correspond to the factorization approach. In the framework of our model we calculate the leptonic decay constants and the form factors of the $B \to D^* (V)$ transitions in the entire physical region of the momentum transfer squared. Finally, we calculate the two-body decay widths and compare our results with other models.

16. **Vacuum system of the crenel and station for irradiation of microchips SOCHI**
Author: V.I. Tyulkin
Veksler and Baldin Laboratory of High Energy Physics, JINR, Dubna, Russia
Abstract:
The article describes a vacuum system with differential pumping of the station and the channel for irradiation of the SOCHI microchips, created within the framework of the implementation of the accelerator complex project based on the Nuclotron superconducting synchrotron accelerator (NICA) at the Joint Institute for Nuclear Research, at the Laboratory of High Energy Physics

17. **Development, Testing, and Upgrade of Trigger and Neutron Detector Systems for the BM@N Experiment**
Author: Valyo Velichkov
Veksler and Baldin Laboratory of High Energy Physics, JINR, Dubna, Russia
Abstract:
A system of trigger detectors has been developed, tested, and upgraded for the BM@N experiment at the NICA accelerator complex. The trigger detectors use plastic scintillators equipped with specialized PMTs and SiPMs operating in the strong BM@N magnetic field and providing high detection efficiency, good pulse-height resolution, and picosecond-level timing. Laboratory studies with the detectors confirmed their readiness for operation in a beam of high-energy heavy nuclei.

During the 2023 run with ^{124}Xe beams at 3.8 A GeV and intensities up to 10^6 ions per spill, the trigger system was successfully operated, demonstrating reliable performance. Time and amplitude resolutions, as well as long-term stability, were investigated, and a small degradation of the detector response under prolonged high-intensity irradiation was observed. These results motivated a comprehensive upgrade program that was implemented in 2024–2025. The program included the introduction of a new counter, BC0, for offline calibration, the redesign of scintillators with light guides to minimize material in the beam path and the construction of BC2 with new PMTs. An in-vacuum design of the Fragment Detector providing the minimum-bias trigger was also implemented. Another aim was the development of detectors with stilbene crystals for the study of neutron energy spectra at small angles by TOF measurements in the 50–5000 MeV range.

Planned activities for 2026 include the installation and testing of a new Barrel Detector, the development of quartz-radiator beam counters, and the analysis of new experimental data from upcoming BM@N runs.

18. Factorization scale effects in QED corrections to e^+e^--annihilation

Author: U.E. Voznaya
Bogoliubov Laboratory of Theoretical Physics, JINR, Dubna, Russia

Abstract:
Factorization scale dependence of the corrections due to the initial state radiation in the process of e^+e^--annihilation to virtual Z-boson or photon at different energies is discussed. It is shown that high values of the factorization scale are preferable. Some numerical results for QED ISR corrections to the cross-section at future collider energies are presented.

19. Daya Bay data release

Author: Vitalii Zavadskyi
Dzhelepov Laboratory of Nuclear Problems, JINR, Dubna, Russia

Abstract:
Daya Bay experiment has collected one of the largest dataset of IBD events with the final-state neutron captured on gadolinium — 5.5 million. This dataset was used to obtain the world leading measurement of sin22θ13 with relative uncertainty 3%.

The joint analysis of the full dataset of Daya Bay and the first 59 days of data taking of JUNO demonstrates significant improvement of measurements of solar parameters sin22θ12 and Δm221.

In this poster we would like to present the dag-modelling framework, discuss it internal structure and demonstrate possibilities of applying it to the full dataset of Daya Bay.

20. Experience in developing a control system for cryogenic liquids and current inputs for the eastern and western half-rings of the NICA Collider

Author: Eketerina Zolotykh
Veksler and Baldin Laboratory of High Energy Physics, JINR, Dubna, Russia

Abstract:
The NICA accelerator complex includes key components such as linear accelerators for light and heavy ions, a booster synchrotron, the Nuclotron synchrotron and two collider rings. The collider consists of the magnetic-cryostat system. This system contains 290 superconducting magnets and two periods of cryogenic liquids and current inputs that provide cooling, cryostating, and current supply to the eastern and western half-rings.
During technical launches and operational runs it is necessary to maintain the operating temperature of the elements in the magnetic-cryostat system. Solving this task requires an appropriate control system to ensure stable and safe operation of the NICA Collider.
This paper describes practical experience in developing a control system for cryogenic liquids and current inputs for the eastern and western half–rings of the NICA Collider, including its operation during cooling of the half-rings.

21. Magnetic measurements of the NICA Collider superconducting magnets

Author: Dmitry Zolotykh
Veksler and Baldin Laboratory of High Energy Physics, JINR, Dubna, Russia

Abstract:
The Lattice of the NICA Collider includes 324 superconducting (SC) magnets. The assembly and testing of magnets were carried out in the scientific and experimental department of superconducting magnets and technologies (SC magnets factory). Result of the magnetic measurements is the most important parameter of quality of the manufactured magnets. A complex of magnetic measurement systems (MMS) for magnetic measurements at an ambient and operating (4.5 K) temperatures, based on rotating harmonic coils method, was developed and successfully applied.

22. Development of production technology for straw tube-based detectors on the example of cooperation between JINR and INP

Author: Kereibay Dias
Veksler and Baldin Laboratory of High Energy Physics, JINR, Dubna, Russia

Abstract:
Detectors based on straw tubes manufactured using ultrasonic welding have proven their high efficiency and reliability, which is confirmed by more than a decade of successful operation of the spectrometer in the NA62 experiment (CERN). This proven technology is ideally suited for future experiments with extreme requirements for radiation hardness, spatial resolution, and long-term reliability. The growing global demand for such detectors from next-generation projects such as SPD, ShiP and FCC requires not just an increase in volume but a qualitative leap toward fully automated and scalable production. In this regard, the deployment of joint automated pilot production

lines at the sites of the Laboratory of High Energy Physics of the Joint Institute for Nuclear Research (JINR) and the Institute of Nuclear Physics (INP Kazakhstan) is a crucial step. This approach will enable full-scale production of straw detectors and strengthen the position of these institutes as a key global developer and supplier of this technology for international collaborations.

23. **Hardware-Software Complex for Anode Wire Tension Measurement in Straw Tubes**

Author: Nurzada Saktaganov
Veksler and Baldin Laboratory of High Energy Physics, JINR, Dubna, Russia

Abstract:
This paper presents a software-hardware complex for measuring the tension of the anode wire in straw tubes used in the SPD experiment's straw tracker at the NICA collider. The tension of the anode wire is critical for ensuring the accuracy of coordinate determination, as it affects electrical stability and the positioning of the wire due to electrostatic and gravitational forces. The developed complex employs an electromagnetic measurement method, allowing for high-precision control of the tension in thin-walled Mylar tubes.
The device measures tension by analyzing wire vibrations. The central component of the system is the STM32L4 microcontroller, which manages the delivery of electrical pulses and performs measurements. The advantages of the complex include ease of setup, a user-friendly interface, and high measurement speed, making it suitable for mass production. Testing confirmed the device's high accuracy and efficiency. Thus, the developed complex represents a significant advancement in the technology for assembling high-precision wire detectors.