7. miniworkshop difrakce a ultraperiferních srážek

Wednesday, 18 September 2024 - Friday, 20 September 2024

ČVUT Děčín

Programme

Table of contents

Wednesday, 18 September 2024

Beyond ALICE (16:30 - 18:20)

-Conveners: Matěj Vaculčiak

[55] Welcome (16:30)

Presenter: VACULČIAK, Matěj

[56] Group introduction (16:45)

Presenter: CONTRERAS, Jesus Guillermo

The motivation and goals of this series of workshops are presented along with a brief overview of the history and the evolution of the workshop through the years. The main areas where the group produces scientific results are discussed. The main results of the group in 2024 are highlighted.

[57] Preparing a Marie Curie grant (17:00)

Presenter: LAVIČKA, Roman

In the life of every scientist there is a moment when ey realizes: "If I really want to continue to do science, I need to get my own financing". This talk is about my struggle in writing my very first major grant proposal. I will tell you how I arrived at this idea, how I decided on the topic, what the full paperwork looks like and what one should not forget. Disclaimer: At this very moment, I'm only a submitter of the grant proposal, not a receiver yet. Maybe, one year from now, this talk may turn into a manual on how not to do it.

[58] Early-Career Researchers Panel (17:20)

Presenter: KRUPOVÁ, Diana Mária

In this talk, I will introduce the Early-Career Researchers (ECR) Panel of the European Committee for Future Accelerators (ECFA), highlighting its mission to support young researchers in the field of particle physics. As one of the representatives for the Czech Republic, I will discuss the panel's activities, including networking opportunities, career development initiatives, and how the panel advocates for the interests of early-career scientists in Europe.

Dinner (19:00 - 21:00)

Thursday, 19 September 2024

Breakfast (08:30 - 09:30)

Phenomenology (09:30 - 12:10)

-Conveners: Vojtěch Zabloudil; Solangel Rojas Torres

[60] Study of non-linear evolution of the hadron structure within QCD (09:30)

Presenter: MAYER, Štěpán

While quantum chromodynamics (QCD) allows the calculation of processes governed by the strong interraction, trying to describe more complex objects like nucleons requires us to simplify the theory with a model. One such simplification is the dipole model accompanied by the Balitsky-Kovchegov (BK) equation. By numerically solving the BK equation, we can calculate the scattering amplitude and learn more about the gluonic structure of protons and neutrons.

[61] Incoherent J/□ production at large |□| identifies the onset of saturation at the LHC (09:50)

Presenter: RIDZIKOVÁ, Alexandra

The study of incoherent production of a vector meson in diffractive processes provides information about the inner composition of the target hadron at the partonic level. The incoherent cross section is sensitivite to fluctuations in the configuration of the color field of the target. The energy-dependent hotspot model, based on the color dipole approach, incorporates subnucleon degrees of freedom known as hot spots. These hot spots represent regions of high gluonic density, and their positions fluctuate event-by-event. As the collision energy increases, an intense concentration of gluons within hadrons occurs, leading to a transition from a dilute to a saturated regime. To investigate this phenomenon, we propose studying the energy dependance of incoherent photoproduction of vector mesons in diffractive processes at various values of Mandelstam-t variable. The |t| distribution is related to fluctuations of different transverse sizes. The coherent cross section is sensitive to nuclear sizes, while incoherent processes are sensitive to both nucleon and hot-spot sizes. We predict that the onset of saturation can be determined at the LHC by measuring the energy dependence of the incoherent J/psi photo-production cross section at large |t|, a region dominated by hot spot contributions.

[62] The Balitsky-Kovchegov equation and dipole orientation (10:10)

Presenter: VACULČIAK, Matěj

A solution of the target-rapidity Balitsky-Kovchegov (BK) equation is presented considering, for the first time, the complete impact-parameter dependence, i.e. including the orientation of the dipole with respect to the impact-parameter vector. To address the non-local behaviour introduced in the target-rapidity formulation of the BK equation, three different prescriptions are considered to take into account the rapidities preceding the initial condition value. The solutions are used to compute the structure functions of the proton and the diffractive photo- and electro-production of J/ψ. These predictions agree well with HERA data, confirming that the target-rapidity Balitsky-Kovchegov equation with the full impact-parameter dependence is a viable tool to study the small Bjorken-x limit of perturbative QCD at current facilities like RHIC and LHC as well as in future colliders like the EIC, for which we present predictions for DIS and diffractive vector meson production.

[64] NLO BK (10:30)

Presenter: MATAS, Marek

The Balitsky-Kovchegov evolution equation tells us much about the gluonic structure of hadronic targets in accelerator experiments. As its leading order form has been around for decades with great successes in high-energy phenomenology, the next-to-leading order version (yielding a more accurate description of the scattering process) proves to be a tough nut to crack. In this talk, we will crack it.

[67] Dark matter (11:10)

Presenter: ČERVENKA, Adam

Dark matter is an astrophysical phenomenon of our time. Apart from observations of its effects on objects in the Universe, it has still not been detected directly on Earth. Its detection is a matter of current research, with limits to the possibility of simultaneous detection assumed based on its velocity distribution. This thesis discusses methods for accelerating dark matter. In particular, it explores the potential of acceleration by the gravitational manoeuvre, which, unlike other acceleration methods, is independent of interaction with ordinary matter, since it uses the only known dark matter interaction to accelerate it, namely gravitational.

[65] Dark photons from light and white colour (11:30)

Presenter: CONTRERAS, Jesus Guillermo
The concept of dark matter is introduced along with the idea of portals that allow the interaction of the Standard Model and the Dark sectors. The photon portal is discussed, in particular in the context of diffractive photoproduction of dark photons. Predictions for this process are presented and the amount of expected events in future facilities is discussed for different parameters of the simplest dark-photon model. It is noted that a window of opportunity to discover dark photons with masses around 1 GeV/c2 seems to be available at the HL-LHC and even maybe at the EIC.

[66] Numerical integration (11:50)

Presenter: MATAS, Marek
Solving problems in contemporary physics often comes hand in hand with the need for accurate numerical integration. With every additional dimension that needs to be integrated over, this problem becomes increasingly more difficult and at some point unsolvable. One possible way to tackle this issue comes with Monte Carlo Importance Sampling integration. I will introduce this method along with snippets of code to facilitate immediate use for the problems you might be facing today.

time	[id] title	presenter
10:50	Coffe break	

Lunch (12:30 - 13:30)

Detectors (14:30 - 18:00)

-Conveners: Diana Mária Krupová; Alexandra Ridziková

[68] Status of the MFT (14:30)

Presenter: HAIDLOVÁ, Sára
The Muon Forward Tracker (MFT) is a silicon pixel detector that was installed as part of the ALICE upgrades in preparation for Run3. This talk presents the current status of MFT together with an overview of its performance during a crucial Pb-Pb data-taking period in 2023. Furthermore, the talk shows several upgrades that were done to various MFT subsystems in order to improve the detector capabilities and monitoring of its performance. Lastly, the talk mentions the physics analysis already done with MFT.

[69] The MuonID project (14:50)

Presenter: SZOLLOSOVA, Timea
The ALICE collaboration is proposing a full detector upgrade to be installed during the Long Shutdown 4. The subsystem discussed in this talk is the Muon Identifier (MID), which will focus on the J/psi at rest reconstruction. This set the requirement for identification of the muons at 1.5 GeV/c transverse momenta with this detector. The current progress of the scintillator working group and the FNSPE group will be presented.

[70] Development of scintillator nanocomposites for UNICORN (15:10)

Presenter: ZABLOUDIL, Vojtěch
An overview of the European project UNICORN which aims to develop novel scintillators based on composites with quantum dots. This talk focuses on the decoupling of light absorption and Rayleigh scattering within the composite via numerical simulations in Geant4 complemented by experimental characterisations of developed samples.

[71] Photon detection system for ProtoDUNE at CERN (15:30)

Presenter: ZABLOUDIL, Michaela
The ProtoDUNE experiment at CERN is crucial in advancing our understanding of neutrino physics and particle detection technologies. This talk will explore the innovative processes used in ProtoDUNE, with a focus on transforming waveform data into charge histograms. By converting complex waveform signals into meaningful charge distributions, we gain critical insights into particle interactions within the detector.

[72] Construction of a Forward Diffractive Detector prototype with new light readout (16:10)

Presenter: TONKA, Matej
ALICE needs to upgrade current FDD (Forward Diffractive Detector) for Run 4. There are several problems that require to be eliminated for run 4 but mainly my thesis deals with shortening time response signal. In my presentation I will discuss basics of

FDD, current problems with it, solutions and what to expect from my work in months to come.

[73] Hands on (16:30)

Presenters: ROJAS TORRES, Solangel, SZOLLOSOVA, Timea
What is the simplest detector you can think of? This session will connect the well-known theory of the Geiger tubes with the physical detectors. Simple measurements with various Geiger tubes and different power sources will be performed.

[74] Cloud chamber in the clouds (17:30)

Presenter: VACULČIAK, Matěj
Combining physics, authentics travel experience and helping others in one beautiful trip. How to create a cloud chamber without dry ice? What not to bring on an indian airplane? Learn this and more before enjoying the conference dinner!

time	[id] title	presenter
15:50	Coffee break	

Dinner (19:00 - 21:00)

Friday, 20 September 2024

Breakfast (08:30 - 09:30)

Analysis (09:30 - 12:10)

-Conveners: Roman Lavička; Marek Matas

[75] LC wave function for nS vector meson states (09:30)

Presenter: ČEPILA, Jan

The wave function entering the amplitude for vector meson production includes the part, where the dipole collapses into a vector meson. This process cannot be computed analytically, because of its non-perturbative character, so there are different models to describe this process. These models are discussed in the presentation. The models are based on the solution of the Schrodinger equation for different realistic potentials of the bound state formed by the quarks forming the vector mesons. The formal description of the problem, as well as its solution for a variety of potentials, is presented in this talk.

[76] Flow of heavy-flavor hadrons in small collisions systems using Run 3 data at the LHC (10:10)

Presenter: LEJEUNE, Alexian Marc

This talk will introduce flow measurements of heavy flavor hadrons in small systems with the goal of investigating the nature of collective phenomena. The presentation will present the procedure that will be used in an analysis that will be conducted on LHC run 3 data in proton-proton collisions. The latter will use the technique of the two particle correlations, using the newest addition to ALICE detectors in run 3 : the Muon Forward Tracker and using a newly developed so called template fit. These methods will be detailed thoroughly during the presentation.

[78] Central J/ψ in 2023 UPCs (10:30)

Presenter: HAIDLOVÁ, Sára

This talk presents one of the first results on the measurements of the J/psi vector meson in the central barrel of ALICE. The presented analysis was done on 30 runs of the 2023 Pb-Pb data-taking period with reconstructed apass2. The results show a need for stricter cut setting and cut analysis for skimmed datasets. Furthermore, it contains one of the first results on the measurements of J/psi in Run3 and preparation for analysis of future apasses and MC data.

[79] Forward J/ψ in UPCs 2023 (11:10)

Presenter: KRUPOVÁ, Diana Mária

This presentation will cover the analysis of forward J/psi photoproduction in ultra-peripheral collisions (UPCs) using Pb-Pb data from ALICE 2023 heavy-ion run. The talk will outline the process of calculating the cross section for the coherent J/psi, and the calculation of each of its components, performed using the O2Physics framework and Hyperloop. Several open items that could further improve the analysis, such as vertexing or the use of the MFT, will also be discussed.

[80] Central ρ in 2023 UPCs (11:30)

Presenter: JURAČKA, Jakub

This talk will present preliminary results of an ongoing analysis of central ρ^0 photoproduction in Pb--Pb UPCs from the 2023 $\sqrt{s_\mathrm{NN}}=5.36$~TeV LHC heavy-ion run. The presentation will introduce the utilised event selections, methods for event tagging into neutron classes based on information from the ZDC detectors, combinatorial background subtraction, and lastly the first results of fits of the invariant mass distributions with an ω-inclusive Söding model. The ρ^0 yields obtained from fits can be used as a convenient starting point for a wide variety of potential further studies.

[82] Goodbye (11:50)

Presenter: VACULČIAK, Matěj

time	[id] title	presenter
10:50	Coffee break	

Lunch (12:30 - 13:30)