

Joint seminar of the NPI of the CAS

Thursday, 29th February 2024

Robert Ličenič (NPI):

Jet physics at STAR

Artem Kotliarov (NPI):

Search for jet quenching effects in high multiplicity pp collisions with ALICE

Corresponding abstracts

Jet physics at STAR (Robert Ličenič)

Jets are created early in collisions of ultrarelativistic particles, such as p+p or Au+Au collisions at the top energies achievable at the Relativistic Heavy Ion Collider, which can be studied at the STAR experiment. Since jets serve as an approximation of individual highly-energetic partons, studying their production in vacuum can be used for testing the predictions of quantum chromodynamics, the theory of the strong interaction. Jet production in heavy-ion collisions is modified by the presence of both cold and hot nuclear matter and therefore serves as a probe inside the quark-gluon plasma created in such collisions. In this seminar, the techniques used in the analyses of jet production will be presented and key jet results by the STAR experiment will be highlighted.

Search for jet quenching effects in high multiplicity pp collisions with ALICE (Artem Kotliarov)

Small collision systems, such as proton-proton or proton-nucleus, have long been considered too small to produce quark-gluon plasma (QGP). However, we have been observing for a decade that proton-proton or proton-nucleus collisions with a large number of particles in the final state (high-multiplicity collisions, HM) exhibit collective phenomena that resemble the signatures of the QGP formation in heavy-ion collisions. At the same time, jet quenching has not been observed in these systems. Quantification or setting limits on the magnitude of jet quenching in small systems is essential for understanding the limits of the QGP formation. This talk discusses the outcomes of a search for jet quenching effects in HM proton-proton collisions at $\sqrt{s} = 13$ TeV collected by the ALICE detector. The analysis measures the semi-inclusive azimuthal acoplanarity distribution of jets recoiling from a trigger hadron with high transverse momentum. The measured acoplanarity distribution for HM events exhibits suppression and broadening when compared to minimum-bias (MB) events. However, these peculiar features are also seen in pp events simulated by the PYTHIA 8 event generator, which does not incorporate jet quenching. The talk will explain the observed suppression and broadening of the HM acoplanarity distribution.