Contribution ID : **181** Type : **Oral talk**

Self-similarity and Cumulative Hadron Production in Heavy Ion Collisions at High Energies

Thursday, 24 October 2024 17:50 (15)

Search for signatures of phase transitions and determination of phase diagram of nuclear matter created in A+A collisions are in the heart of the heavy ion programs performed present at RHIC, LHC and future experiments at NICA and FAIR. In the paper the hypothesis of the self-similarity of hadron production in relativistic heavy-ion collisions to search for the phase transition in nuclear matter is discussed. Using the established features of z-scaling is suggested to reveal the signatures of new physics in the cumulative region. Selection of the cumulative events is assumed to enrich data sample by a new type of collisions characterized by higher energy density and more compressed matter. We expect that this would allow finding clearer signatures of phase transition, location of a critical point and studying extreme conditions in heavy ion collisions. The change in the parameters of the theory (a specific heat and fractal dimensions) near the critical point is considered a signature of new physics. The results of data analysis of cumulative production in p+A and A+A collisions in collider and fixed target mode are discussed.

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Session Classification : Heavy Ion

Track Classification : Heavy ion physics