Contribution ID: **101** Type: **Oral Presentation**

Entanglement, partial set of measurements, and diagonality of the density matrix in the parton model

Wednesday 3 June 2020 12:25 (20 minutes)

We consider the following conundrum: On one hand the proton as a quantum object is in a pure state and is described by a completely coherent wave function with zero entropy. On the other hand in high energy experiments (DIS) when probed by a small external probe, it behaves like an incoherent ensemble of (quasi-free)
partons.

In this talk, we define the "entropy of ignorance" which quantifies the entropy associated with ability to perform only a partial set of measurement on a quantum system. For a parton model the entropy of ignorance is equal to a Boltzmann entropy of a classical system of partons. We analyze a calculable model used for describing low x gluons in Color Glass Condensate approach, which has similarities with the parton model of QCD. In this model we calculate the entropy of ignorance in the particle number basis as well as the entanglement entropy of the observable degrees of freedom. We find that the two are similar at high momenta, but differ by a factor of order unity at low momenta. This holds for the Renyi as well as von Neumann entropies. We conclude that the entanglement does not seem to play an important role in the context of the parton model.

Collaboration (if applicable)

Track

New Theoretical Developments

Contribution type

Contributed Talk

Primary authors: Dr SKOKOV, Vladimir (North Carolina State University); KOVNER, Alexander (University of Connecticut)

Presenter: Dr SKOKOV, Vladimir (North Carolina State University)

Session Classification: Parallel

Track Classification: New Theoretical Developments