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Gluonic hot spots and spatial correlations inside the proton

In this talk, based on arXiv:1605.09176, we present a microscopic realization of the hollowness effect observed in proton-proton scattering at $\sqrt{s} = 7$ TeV. The initial collision geometry proposed in our model could impact significantly the interpretation of data specially sensitive to it, like the eccentricities of proton-proton, proton-nucleus and nucleus-nucleus collisions.
The hollowness effect, not observed at lower energies, consists in a depletion of the inelasticity density at zero impact parameter of the collision. Counterintuitively, there is more inelasticity when the two protons are at about half a fermi transverse separation that for head-on collisions. Our analysis is based on three main ingredients: we rely gluonic hot spots inside the proton as effective degrees of freedom for the description of the scattering process. Next we assume that some non-trivial correlation between the transverse positions of the hot spots inside the proton exists. Finally we build the scattering amplitude from a multiple scattering, Glauber-like series of collisions between hot spots. In our approach, the onset of the hollowness effect is naturally explained as due to the diffusion or growth of the hot spots in the transverse plane with increasing collision energy. Furthermore, we will explore the impact of the non-trivial correlations between the transverse positions of the hot spots in the calculation of eccentricities in proton-proton collisions, a highly debated topic nowadays as there are suggestive signals of collective phenomena, associated to the formation of QGP in heavy ion collisions, in this smaller system that may be caused by the initial state geometry.

Preferred Track

Correlations and Fluctuations

Collaboration

Not applicable

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